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**“AN AIR-BAG ARRANGEMENT”**

10 **THE PRESENT INVENTION** relates to an air-bag arrangement, and more particularly relates to an air-bag arrangement in the form of an inflatable curtain.

It has been proposed previously to provide an air-bag in the form of a so-called “inflatable curtain”. An air-bag of this type is intended to be mounted in the roof of a motor vehicle and, on inflation, is intended to lie adjacent the side windows of the vehicle, thus constituting a “curtain” in order to provide protection for the head of an occupant of the vehicle. A side curtain of this type may be of substantial advantage in the event of a side impact or roll-over situation.

Many proposals have been made in connection with such inflatable curtains.

25 WO 02/085674 A2 shows an inflatable curtain and shows a specific method for folding the curtain. The curtain is folded by using a rolling technique which rolls the curtain about an axis which, in use of the curtain, is substantially horizontal, a terminal part of the curtain then being folded to

extend generally upwardly above the roll. The folded curtain is mounted in position by using this upwardly directed portion.

On deployment of the air-bag, the air-bag effectively unrolls to lie  
5 adjacent a side window of the vehicle.

The disadvantage with the arrangement of WO 02/085674 A2 is that it involves a rolling technique and also a folding technique, meaning that apparatus must be provided to effect the rolling technique and separate  
10 apparatus must be provided to effect the folding technique.

The present invention seeks to provide an improved air-bag arrangement.

15 According to the present invention, there is provided an air-bag arrangement, the air-bag arrangement incorporating an inflatable curtain, the inflatable curtain being rolled to form a roll, part of the inflatable curtain that is to form the upper-most edge of the inflatable curtain when inflated extending downwardly from the roll to lie adjacent a side part of a motor vehicle on which  
20 the inflatable curtain is to be mounted.

Preferably, the part of the inflatable curtain extending downwardly from the roll is a substantially uninflatable region provided with one or more mounting formations.

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Advantageously, the mounting formations comprise a plurality of mounting tabs to be connected to mounting lugs.

Conveniently, the mounting formations comprise a plurality of mounting apertures to engage bolts, Christmas tree snap connectors or the like.

Preferably, the air-bag is associated with a mounting bracket.

Advantageously, the mounting bracket incorporates an open topped  
5 channel dimensioned to receive part of the downwardly-extending part of the  
air-bag.

Conveniently, the side-walls of the channel are provided with co-aligned  
apertures to be co-aligned with the mounting apertures formed in the air-bag, to  
10 enable mounting elements in the form of bolts, Christmas tree snap connectors  
or the like to pass through the co-aligned apertures to mount the bracket and  
thus the inflatable curtain to a motor vehicle.

Preferably, the bracket incorporates a plurality of hooks.  
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Advantageously, the hooks are provided at a position above the open-  
topped channel to engage apertures provided in a side-wall of a motor vehicle.

Conveniently, the bracket includes a supporting platform to support the  
20 rolled air-bag.

Preferably, the rolled air-bag is contained within a protective cover.

Advantageously, the protective cover comprises a sleeve provided with a  
25 breakable seam.

Conveniently, the air-bag is rolled towards the outboard side of the air-  
bag.

Preferably, the air-bag incorporates a gas flow duct, the gas flow duct, when the air-bag is rolled, being provided at the top part of the roll.

5            Advantageously, the or each mounting formation is located at a position which is not above the upper-most part of the roll, and may be located completely below the roll.

10           In order that the invention may already be understood, and so that further features thereof may be appreciated, embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

15           FIGURE 1 is a diagrammatic sectional view of part of an air-bag arrangement in accordance with the invention,

FIGURE 2 is a view corresponding to Figure 1 showing a modified embodiment of the invention, and

20           FIGURE 3 is a view corresponding to Figures 1 and 2 showing a further modified embodiment of the invention.

25           Here it is to be understood that a typical inflatable curtain, as in general use, is provided, adjacent its upper-most edge, with a plurality of mounting lugs or equivalent fixing devices to secure the upper edge of the inflatable curtain to the part of the roof of a motor vehicle which extends above the side door openings and/or side windows of the vehicle. The inflatable curtain may extend the whole length of the vehicle cabin or only part of the length of the vehicle cabin.

Typically, adjacent the upper edge of the inflatable curtain, a gas flow duct is provided which extends across the whole length of the inflatable curtain. Below the gas flow duct are a plurality of inflatable cells or chambers, and  
5 some of the inflatable cells or chambers may be separated by uninflatable regions.

There are many different detailed designs of inflatable curtain, and the present invention is not related to any specific design.

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Figure 1 illustrates an air-bag 1 in the form of an inflatable curtain which is in a rolled condition. The edge 2 of the inflatable curtain which forms the upper-most or top edge when the inflatable curtain is inflated is shown emerging from a generally spiral-wound roll 3, with the edge 2 being directed  
15 so as to extend downwardly. Adjacent the edge 2 the air-bag 1 is provided with a mounting formation in the form of a tab 4. The rolled air-bag is shown immediately adjacent part S of the side of a motor vehicle, and a mounting lug L is shown provided on the side part S of the motor vehicle for co-operation with the mounting tab 4 to secure the air-bag 1 to the vehicle.

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The part of the side curtain extending upwardly from the edge 2 and adjacent the mounting tab 4 forms an uninflatable region 5. Immediately adjacent the uninflatable region 5 is a region of the inflatable curtain that forms a transversely extending gas flow duct 6. The gas flow duct 6 is defined  
25 between two sheets of fabric that have been connected together to form the inflatable curtain. In an alternative embodiment the gas flow duct may be a separate tube, which is separate from the main part of the inflatable curtain. The tube may be of plastic, textile or metal. The sheets of fabric may be sewn together but typically are formed simultaneously using a one-piece weaving

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process which is known *per se*. The two sheets of fabric are shown woven together to form a seam 7 that defines the lower-most edge of the gas flow duct 6. It is to be observed that the gas flow duct 6 extends across the top most part of the roll 3. The roll continues concentrically inwards, the lower-most or  
5 bottom edge 8 of the inflatable curtain being located at the centre of the roll. It is to be understood that the region between the seam 7 and the lower-most edge 8 is provided with the above-mentioned cells or chambers. The cells or chambers, when inflated, constitute a passenger protecting area.

10 Here it is to be understood that the roll 3, in this embodiment, has been formed by rolling the lower-most edge of the inflatable curtain towards the side of the inflatable curtain which, when the inflatable curtain is inflated, constitutes the "outboard" side of the inflatable curtain. The roll may be accomplished using any convenient form of rolling apparatus.

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It is to be appreciated that the inflatable curtain of Figure 1 will be contained within an appropriate package, such as a fabric sleeve or a housing surrounding the roll 3, but the package is not shown at this stage for the sake of clarity.

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In the event that the inflatable curtain is to be inflated, in an accident situation, gas is initially supplied to the gas flow duct 6 from a gas generator (not shown). The gas flow duct 6 thus becomes inflated, at least along part of the length of the gas flow duct. Since the gas flow duct extends across the top  
25 of the roll 3, inflation of the gas flow duct will tend to drive the rest of the roll 3 downwardly. Consequently a downward motion is imparted to the main part of the inflatable curtain. This facilitates the ready inflation of the inflatable curtain so that it occupies a fully deployed state within a very few micro seconds of deployment being instigated.

As the inflatable curtain becomes deployed, so the roll 3 will unroll. Because the roll has been rolled "towards" the outboard sides of the inflatable curtain, the inflatable curtain will unroll in such a way that the main body of the roll tends to be driven towards the adjacent window or side part S of the vehicle. The inflating side curtain will therefore tend to insinuate itself between the head of a seat occupant within the vehicle and the adjacent side of the vehicle, even if the head of the occupant is resting lightly against the window or side of the vehicle, for example, if the seat occupant is sleeping. It is to be understood that it would be possible, if the air-bag unrolled in the opposite sense, for the air-bag to ride over the head of a vehicle occupant if the head of the occupant were lying adjacent the window, with the head of the occupant thus becoming trapped between the air-bag and the window. This is clearly undesirable.

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Figure 1 illustrates a very simple embodiment of the invention. Figure 2 illustrates a rather more practical embodiment of the invention. In this embodiment, the roll 3 described above has been compressed so as to have an oval or more rectangular shape, so that the roll is less obtrusive in the roof-lining of the vehicle. The roll has been surrounded by a textile cover 9 in the form of a sleeve, which has a breakable tape seam 10. The tape seam 10 is intended to rupture on instigation of deployment of the air-bag. Alternatively the textile cover could have a tear line, such as a perforation, or some other line of mechanical weakness.

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In this embodiment of the invention the uninflatable region 5 adjacent the upper-most edge 2 of the inflatable curtain is provided with a mounting aperture 11, and the free edge 2 is received within a channel or slot 12 formed in a mounting bracket 13. The slot 12 is an upwardly open channel. The

mounting bracket 13 incorporates a supporting platform portion 14 which extends beneath the roll 3 to support the roll, and a mounting bolt 15 is provided which extends through co-aligned apertures formed in opposite sides of the channel 12 and which also passes through the mounting aperture 11  
5 formed in the uninflatable region 5 of the inflatable curtain. The bolt 15 may be received within an appropriate threaded mount 16 formed in the side part S of the vehicle, to secure the air-bag to the motor vehicle.

It is therefore to be noted that in both the embodiment of Figure 1 and  
10 the embodiment of Figure 2 the air-bag is mounted in position within the vehicle by co-operating mounting formations which are located separately beneath the main body of the roll 3.

Figure 3 illustrates an embodiment which is similar to that of Figure 2,  
15 save that the mounting bracket 13 comprises an additional upwardly extending finger or flange 17 which extends upwardly from the channel 12 to a position slightly above the mid-point of the roll 3 on the outboard side of the roll 3. The finger 17 terminates with a downwardly-turned hook 18 shown engaged with an aperture 19 formed in the side part S of the vehicle. The hook 18 is provided at  
20 a position close to the channel 12. In the embodiment of Figure 3 the bolt 15 has been replaced by a "Christmas tree" snap connector 20.

It is to be appreciated that in mounting the embodiment of Figure 3 in position in a motor vehicle, initially the hook 18 will be engaged with the  
25 aperture 19 and subsequently the Christmas tree fastener 20 will be engaged with the co-operating mounting 16 formed in the side part S of the vehicle.

Of course, in each embodiment described above, a plurality of mounting configurations will be provided spaced along the length of the inflatable



curtain. Thus in the embodiment of Figure 1 there will be a plurality of attachment tabs 4 and co-operating attachment lugs 6. In the embodiment of Figure 2 there will be a plurality of bolts 15 and in the embodiment of Figure 3 there will be a plurality of Christmas tree snap connectors 20 and a plurality of hooks 18.

In each of the described embodiments, the roll is mounted in position in the motor vehicle by means of one or more mounting arrangements, the mounting arrangements all being located at a level which is not above the top-most part of the roll. In the preferred embodiments, the mounting arrangements include at least one mounting arrangement located beneath the lower-most part of the roll.

In the described preferred embodiments of the invention the roll is located above the mounting arrangement. This has the advantage that there is usually more space available in an upper portion of the roof frame, rather than the lower portion, and thus at least most of the packaged inflatable curtain is located in part of the roof where there is ample space to accommodate it.

It is to be understood that the invention provides the advantage that the inflatable curtain can be simply rolled and packaged, and there is therefore no requirement for a folding apparatus to be provided in addition to the rolling apparatus to facilitate packaging of the inflatable curtain.

In the present Specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".